IN THE CLAIMS

The following is a complete listing of the claims, and replaces all earlier versions and listings.

1. (currently amended) A method of data transmission in a cellular communication system including a base station used for mobile station data transmission over a downlink, ~~such that~~ in which the mobile station transmits base station data over an uplink, comprising the following steps:

(a) M ~~diverse~~ diversity groups of transmission channels each having K transmission channels, where $M \geq 1$, $K \geq 1$, are formed at the base station,

(b) a pilot ~~signals are~~ signal is transmitted from the base station to the mobile station from each of ~~all~~ $M \cdot K$ transmission channels of ~~diverse~~ diversity groups,

(c) impulse responses of $M \cdot K$ transmission channels of ~~diverse~~ diversity groups are estimated at the mobile station using the transmitted pilot signals, ~~which differs in that~~

(d) L_m sets of weighting coefficients of transmission direction each having $K-1$ weighting coefficients of transmission direction ~~are formed at the mobile station using the estimated impulse responses of $M \cdot K$ transmission channels of diverse groups~~, where $1 \leq L_m \leq K$ and $m = 1,2,\ldots,M$ are formed at the mobile station [[,]] for each of M ~~diverse~~ diversity groups of transmission channels,

(e) for each of M diversity groups of transmission channels for each of L_m sets of weighting coefficients of transmission direction, a transfer function of a channel of directional transmission corresponding to [[this]] the set is estimated at the mobile station using the estimated impulse responses of $M \cdot K$ transmission channels of diversity groups,

(f) a feedback signal containing L_m weighting coefficients of transmission direction formed for each of M ~~diverse~~ diversity groups of transmission channels ~~as well as~~ and an estimated transfer function for each of L_m weighting coefficients of transmission direction ~~formed~~ for each of M ~~diverse~~ diversity groups of transmission channels [[is]] are transmitted from the mobile station to the base station,

(g) L_m channels of directional transmission are formed at the base station for each of M ~~diverse~~ diversity groups of transmission channels using the transmitted sets of weighting coefficients of transmission direction,

(h) channels of signal spectrum correction are formed at the base station for each of M ~~diverse~~ diversity groups of transmission channels for each of L_m channels of directional transmission and their transfer functions are corrected according to the transmitted estimated transfer functions of channels of directional transmission in such a way that the reception quality of an information signal at the mobile station is maximized, and

(i) information signal copies are formed at the base station for each of M diversity groups of transmission channels for each of ~~all~~ L_m channels of directional transmission ~~for all M diverse groups of transmission channels~~ and all formed copies of the information signal are simultaneously transmitted over the corresponding channels of directional transmission after applying them to the respective channels of signal spectrum correction.

2. (original) The method of claim 1, wherein all transmitted pilot signals and the information signal are mutually orthogonal or quasi-orthogonal.

3. (original) The method of claim 1, wherein all transmitted pilot signals and the information signal are quasi-orthogonal.

4. (currently amended) [[The]] A method of data transmission, ~~such that~~ comprising the following steps:

M diverse groups of transmission channels each having K transmission channels are formed at the base station, where $M \geq 1$, $K \geq 1$,

pilot signals are transmitted from the base station to the mobile station from all $M \cdot K$ transmission channels of diverse groups,

impulse responses of $M \cdot K$ transmission channels of diverse groups are estimated at the mobile station using the transmitted pilot signals, ~~which differs in that~~

L_m sets of weighting coefficients of transmission direction each having $K-1$ weighting coefficients of transmission direction are formed at the mobile station for each of M diverse groups of transmission channels using the estimated impulse responses of $M \cdot K$ transmission channels of diverse groups, where $1 \leq L_m \leq K$ and $m = 1,2,\ldots,M$,

a feedback signal containing L_m formed sets of weighting coefficients of transmission direction for each of M diverse groups of transmission channels is transmitted from the mobile station to the base station,

L_m channels of directional transmission are formed at the base station at each of M diverse groups of transmission channels using transmitted sets of weighting coefficients of transmission direction,

pilot signals for transmit diversity are transmitted [[form]] from the base station to the mobile station from each of M diverse groups of transmission channels over each of L_m channels of directional transmission,

transfer functions of each of L_m channels of directional transmission are estimated at the mobile station for each of M diverse groups of transmission channels using the transmitted pilot signals for transmit diversity,

a feedback signal containing L_m estimated transfer functions of channels of direction transmission for each of M diverse groups of transmission channels is transmitted from the mobile station to the base station,

channels of signal spectrum correction are formed at the base station for each of M diverse groups of transmission channels for each of L_m channels of directional transmission and their transfer functions are corrected according to transmitted estimated transfer functions of channels of directional transmission in such a way that the reception quality of the information signal at the mobile station is maximized, and

information signal copies are formed at the base station for all L_m channels of directional transmission for all M diverse groups of transmission channels and all formed copies of the information signal are simultaneously transmitted over the corresponding channels of directional transmission after applying them to the respective channels of signal spectrum correction.

5. (currently amended) [[The]] A method of data transmission, ~~such that~~ comprising the steps of:

M diverse groups of transmission channels each having K transmission channels are formed at the base station, where $M \geq 1$, $K \geq 1$,

pilot signals are transmitted from the base station to the mobile station from all $M \cdot K$ transmission channels of diverse groups,

impulse responses of $M \cdot K$ transmission channels of diverse groups are estimated at the mobile station using the transmitted pilot signals, ~~which differs in that~~

L_m sets of weighting coefficients of transmission direction each having $K-1$ weighting coefficients of transmission direction are formed at the mobile station for each of M diverse groups of transmission channels using the estimated impulse responses of $M \cdot K$ transmission channels of diverse groups, where $1 \leq L_m \leq K$ and $m = 1,2,\ldots,M$,

transfer functions of channels of directional transmission corresponding to each of L_m sets of weighting coefficients of transmission direction of all M diverse groups of transmission channels are estimated at the mobile station,

a feedback signal containing L_m formed sets of weighting coefficients of transmission direction for each of M diverse groups of transmission channels is transmitted from the mobile station to the base station,

L_m channels of directional transmission are formed at the base station at each of M diverse groups of transmission channels using the transmitted sets of weighting coefficients of transmission direction,

pilot signals for transmit diversity are transmitted from the base station to the mobile station from each of M diverse groups of transmission channels over each of L_m channels of directional transmission,

transfer functions of L_m channels of directional transmission for each of M diverse groups of transmission channels are estimated at the mobile station using the transmitted pilot signals for transmit diversity,

for each of M diverse groups of transmission channels an estimate of transfer function of each of L_m channels of directional transmission, obtained using K pilot signals transmitted from [[this]] the diverse group of transmission channels, is combined with an estimate of its transfer function, obtained using a pilot signal for transmit diversity transmitted from [[this]] the diverse group of transmission channels,

a feedback signal containing L_m estimated transfer functions of channels of directional transmission for each of M diverse groups of transmission channels is transmitted from the mobile station to the base station,

channels of signal spectrum correction are formed at the base station for each of M diverse groups of transmission channels for each of L_m channels of directional transmission and their transfer functions are corrected according to the transmitted estimated transfer functions of channels of directional transmission in such a way that the reception quality of the information signal at the mobile station is maximized, and

information signal copies are formed at the base station for all L_m channels of directional transmission for all M diverse groups of transmission channels and all formed information signal copies are simultaneously transmitted over the corresponding channels of directional transmission after applying them to the respective channels of signal spectrum correction.

6. (previously presented) The method of claim 3, wherein all transmitted pilot signals, pilot signals for transmit diversity, and the information signal are mutually orthogonal.

7. (previously presented The method of any of claim 3, wherein all transmitted pilot signals, pilot signals for transmit diversity, and the information signal are quasi-orthogonal.

8. (currently amended) The method of claim 1, wherein L_m sets of weighting coefficients of transmission direction each having $K-1$ weighting coefficients of transmission direction are formed at the mobile station for each of M diverse groups of transmission channels using the estimated impulse responses of $M \cdot K$ transmission channels of diverse groups in such a way that a spatial correlation matrix $\hat{R}_{m,n}$ is formed for each of M diverse groups of transmission channels for all of N resolvable paths of the transmitted pilot signals, where $N \geq 1$, as follows

$$\hat{R}_{m,n} = \begin{bmatrix} h_{m,1,n} \\ h_{m,2,n} \\ \\ h_{m,K,n} \end{bmatrix} \cdot \left[\left(h_{m,1,n}\right)^* \quad \left(h_{m,2,n}\right)^* \quad \cdots \quad \left(h_{m,K,n}\right)^* \right],$$

where $h_{m,k,n}$ is a coefficient of the estimated impulse response of transmission channel k of diverse group m corresponding to the resolvable path n of the transmitted pilot signals, $m = 1,2,\ldots,M$, $k = 1,2,\ldots,K$, $n = 1,2,\ldots,N$, and x^* is an operation of complex conjugation

of x, the spatial correlation matrix $\hat{R}_m$ of all resolvable paths is formed for each of M diverse groups of transmission channels as follows $\hat{R}_m = \sum_{n=1}^{N} \hat{R}_{m,n}$,

wherein an averaged spatial correlation matrix $\hat{R}_m(i)$, where $i \geq 1$ is the number of an averaging step, is formed for each of M diverse groups of transmission channels as follows

$$\hat{R}_m(i) = \begin{cases} \hat{R}_m, & i = 1; \\ \alpha \hat{R}_m(i-1) + (1-\alpha)\hat{R}_m, & i > 1; \end{cases}$$

where $0 \leq \alpha \leq 1$ is an averaging coefficient, the averaged spatial correlation matrix $\hat{R}_m(i)$ is decomposed into eigen values $\theta_{m,k}$ and corresponding eigen vectors $\vec{V}_{m,k}$,

where $k = 1,2,\ldots,K$, the maximum eigen value $\theta_{m,\max}$ is selected among eigen values $\theta_{m,k}$, such eigen values $\theta_{m,j}$ are selected among all eigen values that $\theta_{m,j} \geq \beta \cdot \theta_{m,\max}$,

where $0 \leq \beta \leq 1$, $j = 1,2,\ldots,L_m$, L_m is equal to the number of eigen values $\theta_{m,j}$, for which this condition is satisfied, L_m eigen vectors $\vec{V}_{m,j}$ corresponding to L_m selected eigen values $\theta_{m,j}$ are selected, and L_m sets of weighting coefficients of transmission direction each having $K-1$ weighting coefficients of transmission direction are formed as follows

$$W_{m,j,k} = \frac{V_{m,j,k}}{V_{m,j,1}},$$

where $W_{m,j,k}$ is the k-th transmission direction weighting coefficient of the j-th set of transmission direction weighting coefficients of the m-th diverse group of transmission channels, and $V_{m,j,k}$ is the k-th element of the j-th eigen vector of the averaged spatial correlation matrix of the m-th diverse group of transmission channels, $m = 1,2,\ldots,M$, $j = 1,2,\ldots,L_m$, $k = 2,3,\ldots,K$.

9. (currently amended) The method of claim 1, wherein transfer functions of channels of directional transmission corresponding to each of L_m sets of weighting coefficients of transmission direction of all M diverse groups of transmission channels are estimated at the mobile station in such a way that an impulse response of each channel of directional transmission is formed as follows

$$H_{m,j} = \sum_{k=1}^{K} W_{m,j,k} \cdot h_{m,k},$$
$$W_{m,j,1} \equiv 1$$

where $W_{m,j,k}$ is the k-th transmission direction weighting coefficient of the j-th set of transmission direction weighting coefficients of the m-th diverse group of transmission channels, $m = 1,2,\ldots,M$, $j = 1,2,\ldots,L_m$, $k = 1,2,\ldots,K$, $h_{m,k} = \sum_{n=1}^{N} h_{m,k,n} \cdot \delta(t-\tau_n)$ is an impulse response of the k-th transmission channel of the m-th diverse group of transmission channels, where $h_{m,k,n}$ is a coefficient of the estimated impulse response of the k-th transmission channel of the m-th diverse group of transmission channels corresponding to the n-th resolvable path of transmitted pilot signals, τ_n is a delay of the n-th resolvable path of transmitted pilot signals, $m = 1,2,\ldots,M$, $k = 1,2,\ldots,K$, $n = 1,2,\ldots,N$, and an estimate of a transfer function of this channel of directional transmission is equal to the Fourier transform of the formed impulse response $H_{m,j}$ of [[this]] the channel of directional transmission.

10. (currently amended) The method of claim 1, wherein L_m channels of directional transmission are formed at the base station for each of M diverse groups of transmission channels using the transmitted sets of weighting coefficients of transmission

direction in such a way that in each of L_m channels of directional transmission K copies of an input signal of this channel of directional transmission are formed and transmitted over the corresponding transmission channel of [[this]] the diverse group of transmission channels once each copy, starting from the second one, has been multiplied by the corresponding weighting coefficient of transmission direction of the respective set of weighting coefficients of transmission direction.

11. (currently amended) The method of claim 4, wherein for each of M diverse groups of transmission channels an estimate of a transfer function of each of L_m channels of directional transmission, obtained using K pilot signals transmitted from [[this]] the diverse group of transmission channels, is combined with an estimate of its transfer function, obtained using a pilot signal for transmit diversity transmitted from [[this]] the diverse group of transmission channels, in such a way that [[these]] the two estimates are averaged with weights that are inversely proportional to error metrics of [[these]] the estimates.

12. (currently amended) [[The]] A method of data transmission, ~~such that~~ comprising the following steps:

M diverse groups of transmission channels each having K transmission channels are formed at the base station, where $M \geq 1$, $K \geq 1$, ~~which differs in that~~

M diverse groups of receiving channels each having K receiving channels corresponding to M formed diverse groups of transmission channels are formed at the base station,

a signal is transmitted from the mobile station to the base station and received at the base station in each of K receiving channels of each of M diverse groups,

L_m sets of weighting coefficients of transmission direction each having K coefficients are formed for each of M diverse groups of transmission channels using a signal received from the mobile station in such a way that the reception quality of the base station signal received at the mobile station is maximized, where $L_m \geq 0$ and $m = 1,2,\ldots,M$,

L_m channels of directional transmission are formed at each of M diverse groups of transmission channels using formed sets of weighting coefficients of transmission direction,

pilot signals for transmit diversity are transmitted to the mobile station from each of M diverse groups of transmission channels over each of L_m channels of directional transmission,

transfer functions of all L_m channels of directional transmission are estimated at the mobile station for each of M diverse groups of transmission channels using the transmitted pilot signals for transmit diversity,

a feedback signal containing L_m estimated transfer functions of directional transmission channels for each of M diverse groups of transmission channels is transmitted to the base station,

channels of signal spectrum correction are formed at the base station for each of M diverse groups of transmission channels for each of L_m channels of directional transmission and their transfer functions are corrected according to the transmitted estimated transfer functions of directional transmission channels in such a way that the reception quality of the information signal at the mobile station is maximized, and

information signal copies are formed for all L_m channels of directional transmission for all M diverse groups of transmission channels and all formed copies of the information

signal are simultaneously transmitted over the corresponding channels of directional transmission after applying them to the respective channels of signal spectrum correction.

13. (original) The method of claim 10, wherein a signal transmitted from the mobile station to the base station is a pilot signal, or an information signal, or a feedback signal, or a control signal, or any combination of these signals.

14. (original) The method of claim 10, wherein L_m sets of weighting coefficients of transmission direction each having K coefficients are formed for each of M diverse groups of transmission channels in such a way that directions of arrival and the corresponding receiving powers of the received signal are estimated for each of M diverse groups of receiving channels, L_m directions corresponding to L_m maximum average values of received signal power are selected for each of M diverse groups of receiving channels, L_m sets of weighting coefficients of transmission direction each having K coefficients of transmission direction are formed for each of M diverse groups of transmission channels in L_m directions of signal arrival selected for a corresponding diverse group of reception channels in such a way that the reception quality of the signal transmitted from the base station to the mobile station is maximized.

15. (currently amended) The method of claim 10, wherein channels of directional transmission are formed in such a way that in each channel of directional transmission, K copies of an input signal of [[this]] the channel of directional transmission are formed and transmitted over a corresponding transmission channel once each copy of the input signal has

been multiplied by the corresponding weighting coefficient of transmission direction of the respective set of weighting coefficients of transmission direction.

16. (original) The method of claim 10, wherein all transmitted pilot signals for directional transmission and the information signal are mutually orthogonal or quasi-orthogonal.

17. (previously presented) The method of claim 3, wherein transfer functions of all L_m channels of directional transmission are estimated at the mobile station for each of M diverse groups of transmission channels using the transmitted pilot signals for transmit diversity in such a way that an estimate of transfer function of each channel of directional transmission is equal to Fourier transform of estimated impulse response of this channel of directional transmission.

18. (previously presented) The method of claim 1, wherein channels of signal spectrum correction are formed at the base station for each of M diverse groups of transmission channels for each of L_m channels of directional transmission in such a way that a transfer function of each channel of signal spectrum correction is equal to a complex conjugate of the corresponding estimated transfer function of the channel of directional transmission.

19. (currently amended) [[The]] An apparatus for data transmission that includes

M blocks of directional transmission,

$M \cdot K$ summation blocks,

$M \cdot K$ analog transmitters, and

$M \cdot K$ antenna elements,

~~such that~~ wherein

the second inputs of each of M blocks of directional transmission are inputs of [[the]] corresponding weighting coefficients of transmission direction,

each of K outputs of each of M blocks of directional transmission is connected to the second input of the corresponding block of summation,

the first input of each of $M \cdot K$ blocks of summation is an input of the corresponding pilot signal,

outputs of blocks of summation are connected to inputs of [[the]] corresponding analog transmitters,

[[their]] outputs of the corresponding analog transmitters are connected to inputs of [[the]] corresponding antenna elements,

[[their]] outputs of the corresponding antenna outputs are outputs of the apparatus for data transmission, ~~which differs in that~~

and wherein another $\sum_{m=1}^{M}(L_m - 1)$ blocks of directional transmission and $\sum_{m=1}^{M} L_m$ blocks of signal spectrum correction are added, where the first input of each of $\sum_{m=1}^{M} L_m$ blocks of signal spectrum correction is an input of the information signal, the second input of each of $\sum_{m=1}^{M} L_m$ blocks of signal spectrum correction is an input of the corresponding transfer function of the channel of directional transmission, an output of each of $\sum_{m=1}^{M} L_m$ blocks of signal spectrum correction is connected to the first input of the corresponding block of directional

transmission, <u>and</u> each of K outputs of each of $\sum_{m=1}^{M}(L_m - 1)$ additional blocks of directional transmission is connected to $(L_m - 1)$ additional second inputs of the corresponding block of summation, where m takes on the values from 1 to M.

20. (currently amended) [[The]] <u>An</u> apparatus for data transmission that includes

M blocks of directional transmission,

$M \cdot K$ blocks of summation,

$M \cdot K$ analog transmitters, <u>and</u>

$M \cdot K$ antenna elements,

~~such that~~ <u>wherein</u>

the second inputs of each of M blocks of directional transmission are inputs of the corresponding weighting coefficients of transmission direction,

each of K outputs of each of M blocks of directional transmission is connected to the second input of the corresponding block of summation,

the first input of each of $M \cdot K$ blocks of summation is an input of the corresponding pilot signal,

outputs of blocks of summation are connected to inputs of [[the]] corresponding analog transmitters,

[[the]] outputs of [[which]] <u>the corresponding analog transmitters</u> are connected to [[the]] inputs of [[the]] corresponding antenna elements,

[[whose]] outputs <u>of the corresponding antenna elements</u> are outputs of the apparatus for data transmission, ~~which differs in that~~

wherein $\sum_{m=1}^{M}(L_m - 1)$ additional blocks of directional transmission, $\sum_{m=1}^{M} L_m$ blocks of signal spectrum correction, and $\sum_{m=1}^{M} L_m$ summators are added, where the first input of each of $\sum_{m=1}^{M} L_m$ blocks of signal spectrum correction is an input of the information signal, the second input of each of $\sum_{m=1}^{M} L_m$ blocks of signal spectrum correction is an input of the corresponding transfer function of the channel of directional transmission, an output of each of $\sum_{m=1}^{M} L_m$ blocks of signal spectrum correction is connected to the first input of the corresponding summator, the second input of each of $\sum_{m=1}^{M} L_m$ summators is an input of the corresponding pilot signal for transmit diversity, an output of each of $\sum_{m=1}^{M} L_m$ summators is connected to the first input of the corresponding block of directional transmission, and each of K outputs of each of $\sum_{m=1}^{M}(L_m - 1)$ additional blocks of directional transmission is connected to $(L_m - 1)$ additional second inputs of the corresponding block of summation, where m takes on the values from 1 to M.

21. (currently amended) [[The]] An apparatus for data transmission that includes

M blocks of directional transmission,

$M \cdot K$ blocks of summation,

$M \cdot K$ analog transmitters, and

$M \cdot K$ antenna elements, ~~such that~~

wherein

outputs of each of M blocks of directional transmission are connected to inputs of the corresponding blocks of summation,

an output of each of $M \cdot K$ blocks of summation is connected to an input of [[the]] a corresponding analog transmitter, and

an output of each of $M \cdot K$ analog transmitters is connected to [[the]] a first input of [[the]] a corresponding antenna element, [[the]] a first output of each of $M \cdot K$ antenna elements is an output of the apparatus for data transmission, ~~which differs in that~~ and

wherein $\sum_{m=1}^{M}(L_m - 1)$ additional blocks of directional transmission, $\sum_{m=1}^{M} L_m$ blocks of signal spectrum correction, $\sum_{m=1}^{M} L_m$ summators, $M \cdot K$ analog receivers, and M weighting coefficients of transmission direction forming blocks are added, where the first input of each of $\sum_{m=1}^{M} L_m$ blocks of signal spectrum correction is an input of the information signal, the second input of each of $\sum_{m=1}^{M} L_m$ blocks of signal spectrum correction is an input of the corresponding transfer function of channel of directional transmission, an output of each of $\sum_{m=1}^{M} L_m$ blocks of signal spectrum correction is connected to the first input of the

corresponding summator, the second input of each of $\sum_{m=1}^{M} L_m$ summators is an input of the corresponding pilot signal for transmit diversity, an output of each of $\sum_{m=1}^{M} L_m$ summators is connected to the first input of the corresponding block of directional transmission, K second inputs of each of $\sum_{m=1}^{M} L_m$ blocks of directional transmission are connected to K corresponding outputs of the respective weighting coefficients of transmission direction forming block, outputs of each of $\sum_{m=1}^{M} (L_m - 1)$ additional blocks of directional transmission are connected to additional inputs of the corresponding blocks of summation, the second input of each of $M \cdot K$ antenna elements in an input of the receiving signal, the second output of each of $M \cdot K$ antenna elements is connected to an input of the corresponding analog receiver, <u>and</u> an output of each of $M \cdot K$ analog receivers is connected to the corresponding input of the respective weighting coefficients of transmission direction forming blocks.

22. (currently amended) The apparatus of claim [[17]] <u>19</u>, wherein the block of directional transmission consists of K multipliers, where combined first inputs of K multipliers are the first input of block of directional transmission, their second inputs are the second inputs of block of directional transmission, and their outputs are outputs of the block of directional transmission.

23. (new) A method of data transmission in a cellular communication system including a base station used for mobile station data transmission over a downlink, in which the mobile station transmits base station data over an uplink, comprising the following steps:

(a) M diversity groups of transmission channels each having K transmission channels are formed at the base station, where $M \geq 1$, $K \geq 1$,

(b) a pilot signal is transmitted from the base station to the mobile station from each of $M \cdot K$ transmission channels of diversity groups,

(c) impulse responses of $M \cdot K$ transmission channels of diversity groups are estimated at the mobile station using the transmitted pilot signals,

(d) L_m sets of weighting coefficients of transmission direction each having $K-1$ weighting coefficients of transmission direction are formed at the mobile station,

(e) $M \cdot K$ transmission channels of diversity groups are formed at the mobile station for each of M diversity groups of transmission channels using the estimated impulse responses of $M \cdot K$ transmission channels of diversity groups in such a way that a spatial correlation matrix *Rm,n* is formed for each of M diversity groups of transmission channels for all of N resolvable paths of the transmitted pilot signals, where $N \geq 1$, as follows

$$R\,\hat{}\;m,n = [\,h\;m,1,n\;h\;m,2,n\;h\;m,K,n][(h\;m,1,n) * (h\;m,2,n) * (h\;m,K,n) *]$$

where h.sub.m,k, n are coefficients of the estimated impulse response of transmission channel k of diversity group m corresponding to the resolvable path n of the transmitted pilot signals,

and m=1,2,...M, k=1,2,...K, n=1,2,...N, xI is an operation of complex conjugation of x,

(f) the spatial correlation matrix Rm of all resolvable paths is formed for each of M diversity groups of transmission channels as follows:

the matrix R sub m(i) + the matrix R sub m for i = 1;

alpha x the matrix R sub m(i-1) + (1-alpha) x Rsub m for i > 1;

where $0 \leq$ alpha ≤ 1 is an averaging coefficient,

(g) the averaged spatial correlation matrix Rsub m(i) is decomposed into eigen values Thetasub m, k and corresponding eigen vectors Vsub m, k, where k=1,2,...K, the maximum eigen value Thetasub m/max is selected among eigen values Thetasub m, κ, eigen values Thetasub m, j are selected among all eigen values, Thetasub m,j >=(Beta x Thetasub m/max), where 0<=Beta<=1, j=1,2,...Lsub m, and Lsub m is equal to the number of eigen values Thetasub m, j, for which this condition is satisfied,

(h) Lsub m eigen vectors Vsub m, j, corresponding to Lsub m selected eigen values Thetasub m, j, are selected, Lm sets of weighting coefficients of transmission direction each having K-1 weighting coefficients of transmission direction are formed as follows:

Wsub m, j, k = ((Vsub m, j, k)/(Vsub m, j, 1)),

where Wsub m, j, k is the k-th transmission direction weighting coefficient of the j-th set of transmission direction weighting coefficients of the m-th diversity group of transmission channels, Vsub m, j, k is the k-th element of the j-th eigen vector of the averaged spatial correlation matrix of the m-th diversity group of transmission channels m= 1,2,...,M, j = 1,2,...Lsub m, k = 2, 3, ... K;

(i) a feedback signal containing L_m sets of weighting coefficients of transmission direction formed for each of M diversity groups of transmission channels and an estimated transfer function for each of L_m sets of weighting coefficients of transmission direction for

each of M diversity groups of transmission channels is transmitted from the mobile station to the base station,

(j) L_m channels of directional transmission are formed at the base station for each of M diversity groups of transmission channels using the transmitted sets of weighting coefficients of transmission direction,

(k) channels of signal spectrum correction are formed at the base station for each of M diversity groups of transmission channels for each of L_m channels of directional transmission and their transfer functions are corrected according to the transmitted estimated transfer functions of channels of directional transmission in such a way that the reception quality of an information signal at the mobile station is maximized,

(m) information signal copies are formed for all L_m channels of directional transmission for all M diversity groups of transmission channels and all formed copies of the information signal are simultaneously transmitted over the corresponding channels of directional transmission after applying them to the respective channels of signal spectrum correction.

24. (new) The method of claim 23, wherein transfer functions of channels of directional transmission corresponding to each of Lm sets of weighting coefficients of transmission direction of all M diversity groups of transmission channels are estimated at the mobile station in such a way that an impulse response of each channel of directional transmission is formed as follows:

Hsub m, j = summation of from 1 to K of (Wsub m, j, k x hsub m, k), W m, j, 1, ident 1, where Wsub m, j, k, where $W_{m,j,k}$ is the k-th transmission direction weighting coefficient of the j-th set of transmission direction weighting coefficients of the m-th diversity group

of transmission channels, $m = 1,2,\ldots,M$, $j = 1,2,\ldots,L_m$, $k = 1,2,\ldots,K$, hsub m, k = summation of from 1 to N of (hsub m, k, n x ə(1 – 1sub n) is an impulse response of the k-th transmission channel of the m-th diversity group of transmission channels, where $h_{m,k,n}$ is a coefficient of the estimated impulse response of the k-th transmission channel of the m-th diversity group of transmission channels corresponding to the n-th resolvable path of transmitted pilot signals, τ_n is a delay of the n-th resolvable path of transmitted pilot signals, $m = 1,2,\ldots,M$, $k = 1,2,\ldots,K$, $n = 1,2,\ldots,N$, an estimate of a transfer function of this channel of directional transmission is equal to the Fourier transform of the formed impulse response $H_{m,j}$ of this channel of directional transmission.

25. (new) A method of data transmission in a cellular communication system including a base station used for mobile station data transmission over a downlink, in which the mobile station transmits base station data over an uplink, comprising the following steps:

(a) M diversity groups of transmission channels each having K transmission channels, where $M \geq 1$, $K \geq 1$, are formed at the base station,

(b) a pilot signal is transmitted from the base station to the mobile station from each of $M \cdot K$ transmission channels of diversity groups,

(c) impulse responses of $M \cdot K$ transmission channels of diversity groups are estimated at the mobile station using the transmitted pilot signals,

(d) L_m sets of weighting coefficients of transmission direction each having $K-1$ weighting coefficients of transmission direction, where $1 \leq L_m \leq K$ and $m = 1,2,\ldots,M$ are formed at the mobile station for each of M diversity groups of transmission channels,

(e) for each of M diversity groups of transmission channels for each of L_m sets of weighting coefficients of transmission direction, a transfer function of a channel of directional transmission corresponding to the set is estimated at the mobile station using the estimated impulse responses of $M \cdot K$ transmission channels of diversity groups,

(f) a feedback signal containing L_m weighting coefficients of transmission direction formed for each of M diversity groups of transmission channels and an estimated transfer function for each of L_m weighting coefficients of transmission direction for each of M diversity groups of transmission channels are transmitted from the mobile station to the base station,

(g) L_m channels of directional transmission are formed at the base station for each of M diversity groups of transmission channels using the transmitted sets of weighting coefficients of transmission direction,

(h) channels of signal spectrum correction are formed at the base station for each of M diversity groups of transmission channels for each of L_m channels of directional transmission and their transfer functions are corrected according to the transmitted estimated transfer functions of channels of directional transmission in such a way that the reception quality of an information signal at the mobile station is maximized, and

(i) information signal copies are formed at the base station for each of M diversity groups of transmission channels for each of ~~all~~ L_m channels of directional transmission and all formed copies of the information signal are simultaneously transmitted over the corresponding channels of directional transmission after applying them to the respective channels of signal spectrum correction,

wherein transfer functions of channels of directional transmission corresponding to each of L_m sets of weighting coefficients of transmission direction of all M diverse groups of transmission channels are estimated at the mobile station in such a way that an impulse response of each channel of directional transmission is formed as follows

$$H_{m,j} = \sum_{k=1}^{K} W_{m,j,k} \cdot h_{m,k},$$
$$W_{m,j,1} \equiv 1$$

where $W_{m,j,k}$ is the k-th transmission direction weighting coefficient of the j-th set of transmission direction weighting coefficients of the m-th diverse group of transmission channels, $m = 1,2,\ldots,M$, $j = 1,2,\ldots,L_m$, $k = 1,2,\ldots,K$, $h_{m,k} = \sum_{n=1}^{N} h_{m,k,n} \cdot \delta(t - \tau_n)$ is an impulse response of the k-th transmission channel of the m-th diverse group of transmission channels, where $h_{m,k,n}$ is a coefficient of the estimated impulse response of the k-th transmission channel of the m-th diverse group of transmission channels corresponding to the n-th resolvable path of transmitted pilot signals, τ_n is a delay of the n-th resolvable path of transmitted pilot signals, $m = 1,2,\ldots,M$, $k = 1,2,\ldots,K$, $n = 1,2,\ldots,N$, and an estimate of a transfer function of this channel of directional transmission is equal to the Fourier transform of the formed impulse response $H_{m,j}$ of the channel of directional transmission.